

What is claimed:

1. A process for making surface-modified ceramic materials comprising:
  - a. creating a thin layer of a titanium phosphate on a base material;
  - b. subsequently treating with a strong base; and
  - c. washing the product of step b.
2. The process of claim 1 further comprising drying the product after washing.
3. The process of claim 2 further comprising calcining the dried product.
4. The process of claim 1 further comprising:
  - a. contacting the washed product with a strong acid; and
  - b. subsequently washing the product to form a gelatinous layer of titanium oxide hydrate on the base material.
5. The process of claim 4 further comprising drying the product with the gelatinous layer.
6. The process of claim 5 further comprising calcining the dried product.
7. The process of claim 4 further comprising treating the product with a dopant.
8. The process of claim 5 further comprising sequentially treating the dried product with a dopant and then drying.
9. The process of claim 8 further comprising calcining the dried product.
10. The process of claim 1 where the base material is titanium dioxide.

11. The process of claim 1 where the base material is selected from the group consisting of a ceramic metal oxide, a ceramic mixed oxide, a mixed metal oxide, or a mixture thereof.
12. The process of claim 11, where the ceramic metal oxide is selected from the group consisting of  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$ , and mixtures thereof.
13. The process of claim 8 where the dopant is a noble metal resistant to strong base and strong acid.
14. The process of claim 12 where the ceramic metal oxide consists of nano-sized particles with a size between 20 and 100 nm.
15. The process of claim 1 where the strong base is KOH.
16. The process of claim 4 where the strong acid is HCl.
17. The process of claim 7 wherein the dopant is selected from the group consisting of a colloidal metal, a colloidal complex, an organic compound, an inorganic salt, and mixtures thereof.
18. The process of claim 4 further comprising:
  - a. saturating the surface with a water-soluble organic or inorganic compound;
  - b. subsequently drying; and
  - c. calcining.
19. The process of claim 4 further comprising:
  - a. saturating the surface with a colloid material;
  - b. subsequently drying; and
  - c. calcining.

20. The process of claim 17 wherein the dopant is a colloidal metal and the final product has a thin metal oxide surface layer.